

Navigating innovation opportunities and challenges

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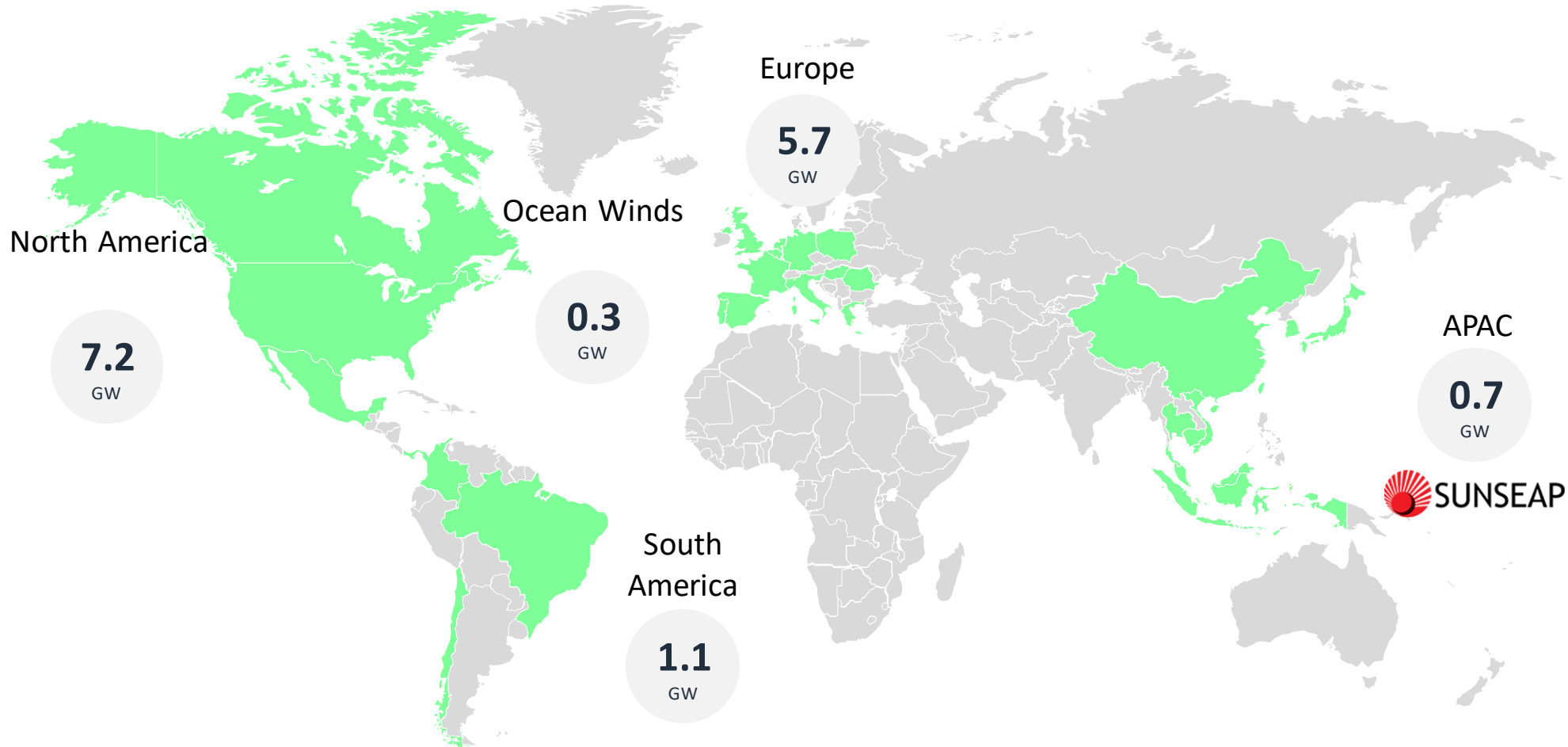


USS R&D Congress 2023

5 Oct 2023

EDPR is a global renewables player with a portfolio of 14.7 GW and presence in 28 markets with 3,000 employees worldwide

A global leadership, complemented by EDPR Sunseap and its APAC markets



Top 4
wind & solar
player

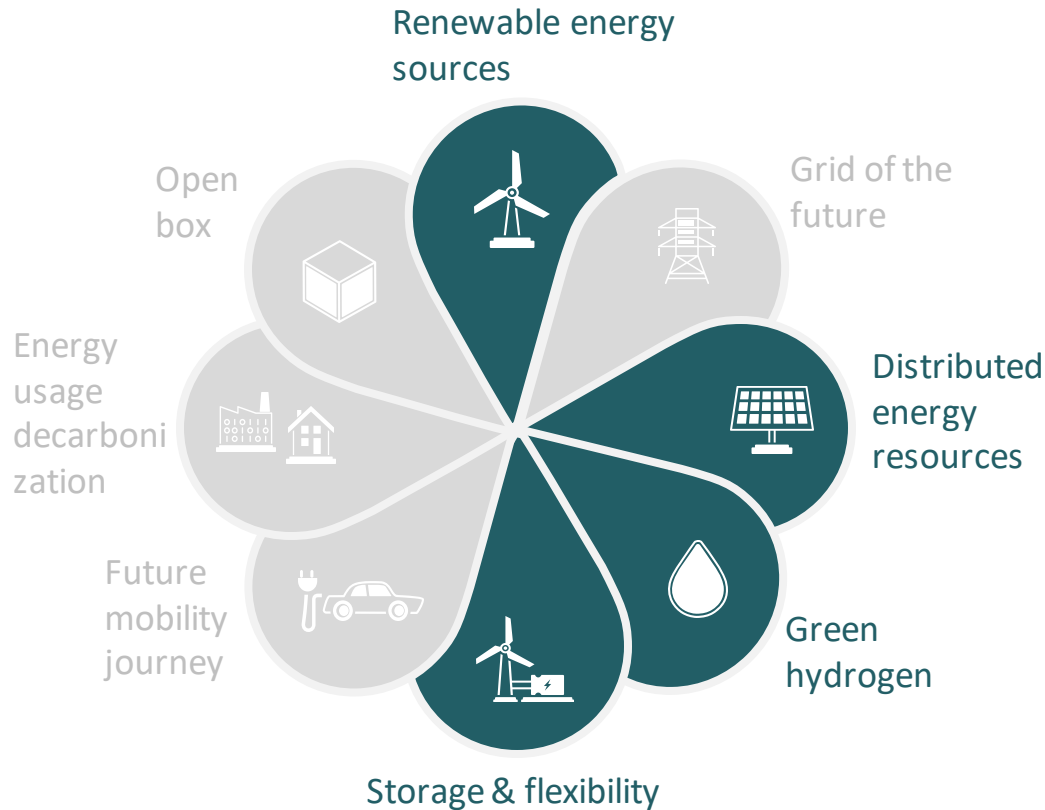
+20 GW
additions 2021-
25

50 GW
capacity
by 2030

EDPR APAC innovation strategy can accelerate the future of Singapore's Energy Story

Adapting to the region's needs and reality by establishing a hub in Singapore

Innovation Domains



R&D + VC



AI for Non-Intrusive Load Monitoring
Saving costs with anomaly detection and predictive maintenance

Participation in:

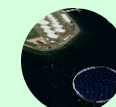


GREEN LI-ION
GCHARGE+

Pre-Commercial



Singapore's first utility-scale 2.4MWh ESS
Paved the way for ancillary services regulatory changes



Pulau Ubin, Sebarok
Testing Vanadium Flow batteries in operational environment

Commercial

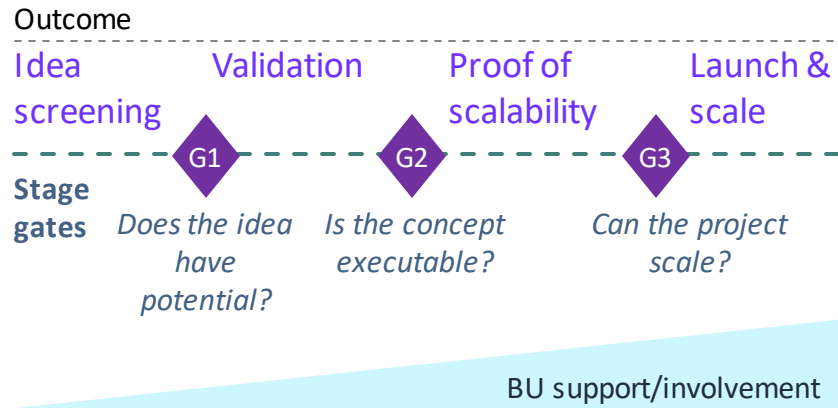


ESS projects
In relevant markets
Providing shifting or ancillary services to the grid

We drive innovation by encouraging an entrepreneurial work culture, supporting promising startups and building open ecosystems

Internal Delivery

Development of internal business opportunities



Venture Investments

Investing in promising startups that can transform the energy sector

Global Investor

About **€50M invested in >30 portfolio companies** across the globe in 10 different countries

Seed to Series B

Tickets ranging from €1-10M and **overall investment capacity of €100M** for 2022-25



Energy transition startups / scaleups

Focus on **startups / scaleups that intend to transform the energy sector** and answer to the digital transformation challenges, in line with EDP Group innovation priorities

Open Ecosystems

Co-creation through partnerships, testing new technologies through pilot projects

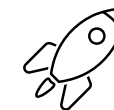
Open Innovation Programs

Promote business development programs to fast-track the incorporation of innovative solutions



Pilot Projects

Lead Projects with Startups and support Bus delivering pilot results for scale-up or to EDP Ventures for investment



Open Ecosystem Partnerships

Map, engage and promote open ecosystem partnerships & startup alumni



We advance our technical and commercial capabilities through support from Singapore's grant ecosystem.



Punggol HDB
ESS to manage solar intermittency.



2019



Pulau Ubin microgrid
Aims to improve solar generation and flow battery efficiency.



2023



Woodlands ESS testbed
Paved the way for regulatory changes for new ESS installations.



2024



Pulau Sebarok microgrid
Investigate novel solar floating platform technologies.



01

Energy Storage Testbed @ Woodlands substation



Understand technical, regulatory and commercial challenges faced throughout the project cycle of a grid-tied BESS.

- Worked with authorities to overcome regulatory challenges and set precedents to deploy Singapore's first utility-scale ESS.
- Provided grid services such as Regulation and Reserves.
- Knowledge gained led to regulatory changes that allowed utility ESS to be commercially viable.



CAPEX investment



S\$ 7mil

System size



2.4 MW

2.4 MWh

Regulation provided



+1.7 GWh



-1.5 GWh

Operation period

Aug 2021 – Aug 2022

Supported By



02

Off-grid microgrid @ Pulau Ubin



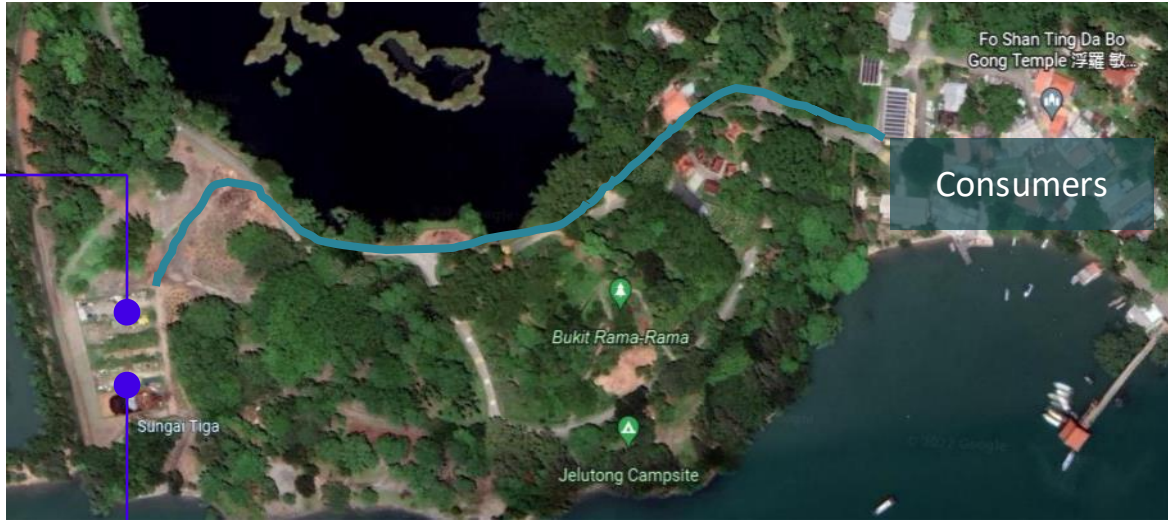
Evaluate 1) Vanadium Flow Battery as an alternative to Li-ion and 2) Greenery to improve rooftop solar efficiency.

330kWp Rooftop Solar with Greenery



Built above a storage shelter roof.

SIT will investigate effect of lower temperatures on solar efficiency due to rooftop greenery.



1 MWh Vanadium Flow Battery

Storage of solar energy for use at night and for grid-forming.

SIT will explore ways to improve the efficiency of the battery through a smart pump management system.

CAPEX investment

S\$ 4mil

System size

330 kWp
 0.2 MW 1 MWh

Est. COD
 Oct 2023

Annual savings

268 tCO₂
 S\$ 100k

Supported by



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Takeaways



Key Takeaways

- Mitigate technology risks through research partners and 3rd parties or insurers, safeguards for safety risks, commercial base cases for financial risks;
- Management buy-in and set realistic expectations for commercial outcomes;
- Staying connected with the industry and regulators to understand evolving needs and landscape;
- Creativity, open-mindedness and persistence/resilience.

“Innovation is the ability to see change as an opportunity, not a threat.”

Steve Jobs

